

REPORT

OF

THE SECRETARY OF THE NAVY,

COMMUNICATING

The report of officers appointed by him to make the examination of the iron, coal, and timber of the Deep river country, in the State of North Carolina, required by a resolution of the Senate.

JANUARY 18, 1859.—Ordered to lie on the table; motion to print referred to the Committee on Printing.

FEBRUARY 9, 1859—Report in favor of printing the usual number submitted, considered, and agreed to

NAVY DEPARTMENT, *January 17, 1859.*

SIR: In compliance with the resolution of the Senate of April 13, 1858, authorizing and instructing the Secretary of the Navy "to cause a thorough examination of the iron, coal, and timber of the Deep river country, in the State of North Carolina, and that he report upon the expediency of establishing, at some point in that State, machine and workshops for the construction of engines, boilers, &c., for naval vessels, and that he report the same to Congress at its next session," I directed, in July last, a commission of officers, consisting of Captain Wilkes, Chief Engineers Hunt and Martin, and Naval Constructor Pook, to proceed to North Carolina to make an examination of the region designated in the resolution, and report the result to the department. I now have the honor to transmit herewith their reports, with the accompanying maps and diagrams.

There are already extensive establishments, in very complete condition, for the manufacture and repair of marine steam engines and their dependencies at Boston, New York, Philadelphia, and Norfolk, which were erected at great expense, and are sufficient for the present wants of our small steam navy. In view, therefore, of the present condition of the treasury, the provisions already made at the four navy yards mentioned, and the facts embodied in the reports of the commission, I should not deem it expedient at this time to establish in North Carolina machine and work shops for the construction of engines, boilers, &c., for naval vessels.

I am, very respectfully, your obedient servant,

ISAAC TOUCEY.

Hon. JOHN C. BRECKINRIDGE,

Vice President of the United States and President of the Senate.

WASHINGTON, *December 30, 1858.*

SIR: In obedience to your order of the 21st of July, appointing a commission, to consist of myself, Chief Engineers Henry Hunt and D. B. Martin, and Naval Constructor S. M. Pook, to make a thorough examination of the Deep river country in the State of North Carolina, and to report upon the expediency of establishing, at some point in that State, machine and work shops for the construction of engines, boilers, &c., for naval vessels, as embraced in a resolution of Congress, April 13, I have the honor to submit the following reports:

In this examination I was engaged during the months of August and September, and received every facility and aid which could be desired from Governor Bragg and other authorities of the State, by whom we were furnished with the most recent official reports and maps of Professor Emmons, the State geologist. I have also to acknowledge great assistance and kind hospitality from the inhabitants of the Deep river country, who united to aid us in our duties, many of them devoting their time exclusively and affording us much local information. Among them our thanks are especially due to Mr. William McClane, of the Egypt Company, Mr. Evander McIvers, Captain Bryan, Mr. Clegg, Mr. L. Haughton, Major Morrell, and Mr. Cantwell, of Raleigh. All the positions and localities reported upon by others were visited by us and carefully examined.

I feel I should be doing great injustice to Professor Emmons did I not bear witness to his labors and the use his several reports have been to me in my examinations; and where I have differed from him I have done so with much diffidence, for to his untiring observations great deference is due. I trust that his valuable labors will not be interrupted, but continued till the whole of the State has been examined. There is certainly no expenditure of money so profitable as that which is applied to the development of the resources of the State, and these examinations, to be well and carefully done, require both time and the expenditure of money.

Before entering into the details of our examination of the Deep river district, it may be proper to give the extent of the sandstone formation of this part of North Carolina in which the coal measures lie.

Professor Olmstead, of Yale College, was the first to define this extent, in 1824, and more recently it has been examined by Professor Emmons. They both agree that its northern terminus is near Oxford, in Granville county, where it comes to a point. It passes from thence in a southwesterly direction across the State for 120 miles, and has its terminus about 6 or 7 miles within the boundary of South Carolina. The breadth of the formation varies. Between Raleigh and Chapel Hill it is reported as being 18 miles. On the Cape Fear I found it less than five, which continues for some 10 miles to the southward and westward. It then suddenly enlarges to 12 miles, embracing the whole valley of the Deep river district, and is then continued, contracting gradually, till it passes out of the State, near Wadesborough.

The rocks which bound this sandstone formation are the metamorphic slates, gneiss, and granites; on these the formation reposes.

Their outcrops are seen with a great dip to the northwest, giving a well defined outline of this sandstone deposit.

A particular description of the geographical position of the Deep river country is deemed necessary from the fact that but little is known of it even in the capital of North Carolina.

The Deep river district is situated 30 miles southwest from Raleigh, 15 miles south from Pittsborough, and 50 miles north of Fayetteville. It occupies the very centre of the State, and comprises part of the counties of Chatham and Moore. It forms an extensive valley, bounded by the Pittsborough hills on the north and east, the Buckhorn hills on the south, and the Carthage hills on the west.

This area lies between the Cape Fear river on the east and the Hancock mills on the west, the head waters of the creeks flowing to the Deep river from the south, and those which take their rise towards Pittsborough on the north. This district is about 25 miles in length by 10 miles in width, and embraces an area of some 250 or 300 square miles. To this our examination was confined, and this extent is comprised within the limits of the map which accompanies this report.

The Deep river takes its rise in the county of Guilford, flows to the southeast through the county of Randolph, with a descent of some 500 to 600 feet in some 60 miles, until it enters the county of Moore, in the neighborhood of Hancock's mills, towards which its current is rapid; thence its general direction is to the north of east for 30 miles, pursuing a very tortuous and sluggish course, with a fall of 27 feet, and joins the Haw river, at that distance, coming from the northwest to form the Cape Fear river.

The country which it drains comprises an area of one thousand miles, affording an abundant supply of water for its slack-water navigation and for milling purposes. It is subject, occasionally, to great freshets in the lower part, which overflow its banks to the depth of ten or twelve feet, but owing to the sluggish flow of the current, it passes off without damage to the crops and farms.

In our examination of the coal and iron of this district I must refer to the geological formation, and, for the purpose of more clearly illustrating and understanding the limits, will treat it as an independent formation, (for such it may be regarded, being unconformable to the primitive rocks,) under its three natural divisions, viz:

First. The conglomerate and lower red sandstone.

Second. The coal measures, including the sandstones of a drab color, bituminous shales, and slates.

Third. The tertiary and drift.

These three occupy the depression, or basin, of the primitive formation, the outline of which may be recognized a short space beyond the outcrops.

In every part of the coal field we have evidence that the conglomerates rest upon the metaphoric slates, gneiss, or granite. The effects of upheaval, as well as diluvial action, are visible in many places throughout its extent.

In order to define the extent of the basin I found it necessary to search not only for the outcrop of the coal but also for the outcrops

of the underlying as well as the outlying rocks; and, assisted by information derived from reliable authority, I succeeded in tracing it from one locality to another, until I had obtained what I deemed sufficient evidence of the margin of the basin or trough.

The annexed diagram of a section across the coal field will better explain the formation:



Metamorphic slates.

Section of coal field, Deep river.

Metamorphic slates.

1. Conglomerate; 2. Red sandstone; 3. Black slates; 4. Dark sandstone, fire clay; 5. Shales and iron ore; 6. Coal; 7. Argillaceous slates.

The following is the course which it follows:

The line of outcrop of this coal has been traced, beginning near Dye's, to the eastward of the plantation of Evander McIvers; thence westward some two miles, near the house of McIvers, turning there to the north-northwest of his plantation; thence towards the northeast for two and a half miles, and then to the westward, crossing the Deep river at Mr. Wicker's plantation, from which place to the westward, passing through the Farmersville plantation in nearly a straight line, touching the river near the bend opposite Egypt, and continuing beyond through the Taylor, Haughton, Tysor, and Palmer plantations, a distance of seven miles.

From the latter to the Bingham plantations its course is west-southwest five miles, and thence it passes on a more westerly course, through the Murchison and Forshee plantations three miles, again crossing the river, and is covered up near the latter by the overlying debris of the rocks.

On the south the coal does not outcrop, owing to thick covering of the debris of the rocks, which has been deposited over it. We have therefore to refer to the outcrops of the conglomerates and red sandstone, and the dip and strike of the slates and sandstones overlying the coal measures on the western end, to assist us in arriving at the form of this basin.

The conglomerates are seen to extend beyond the coal at the southwestern end; several quarries have been worked on Richland creek, where the millstones have been sought for and found. Their direction changes towards the south and southeast, across the range of the sandstone formation of the State. This is also observed of the slates and sandstones, the dips tending towards the axis, while the strike conforms to the margin of the basin. The slates are generally argillaceous and destitute of fossils; the sandstones are fine, with ripple marks resembling those which lie beneath the coal of the Egypt shaft.

The rock which has been termed the upper red sandstone I have nowhere encountered, except beyond the margin or a short distance within the basin, as an upper deposit. I think it has no place in the

formation of this trough or basin; but it is of recent origin, probably of the tertiary. It lies unconformably to the rocks of the basin, and the beds of pebbly quartz, which in certain localities are found near it, appear to me to be accumulated drifts from the older and outlying rocks.

In all cases where the conglomerate crops out we find the lower red sandstone accompanying it.

The lower rocks are seen on the south side along the courses of the creeks which flow towards the Deep river, where they crop out with a dip towards the northwest and a strike to the northeast and southwest. The southern outcrops are not so distinct or continuous as on the northern sides, yet they offer abundant evidence of the limit to which the coal must be circumscribed. The rocks have a less and opposite dip, but the strike conforms to the basin. These rocks lie in contact with the primitive formation of metamorphic slates, gneiss, and granite, along the Buckhorn range, the whole surface of which is strewn with fragmentary quartz.

These outcrops have been further traced to the northeastward to Gilmore's mill, on Pattison's creek; to the north at Evander McIver's mill, on the Great Buffalo creek, and at the Little Buffalo church; thence to the eastward, again outcropping on the head waters or branches of Lick creek, near Kelley's mills, at the "Sisters" and "Wooley Rock;" thence to below the mouth of Lick creek, and about a mile above the junction of the Buckhorn creek with the Cape Fear river.

The conglomerate on the north side is seen at House's quarry, then near Jones' falls, dipping to the eastward, and (thence is traced to Ellington's, by Professor Emmons;* then to the southwestward to near Y. Wicker's plantation, where it makes a turn to the northwest towards M. Wicker's,) passing between his house and the Deep river; crosses the Deep river near George's creek, and pursues a course to the westward a short distance, to the north of the outcrops of the coal, and nearly parallel to its curve.

Thus I have traced the peculiar outline of the basin or trough, and thereby determined its length and width. The form will be better understood by examining the maps on which it is shown.

It will thus be seen that from Evander McIver's to Ellington's the north and south conglomerates, with the red sandstones, approach nearest to each other, and have almost a parallel direction, with opposite dips. They are not separated more than two and a half miles.

It is therefore evident that the older rocks have narrowed the depression, though perhaps not lessened the depth; consequently, some of the overlying rocks may be wanting, or thin out, as they are observed to do near this locality.

The topography of the country shows that the outcrops of the con-

*The line of the outcrop of the conglomerate from Jones' falls to Ellington's, and thence to Wicker's, I have adopted upon the authority of Professor Emmons' map. I had no opportunity to trace this outline, but I am inclined to believe that there is some error in it, and that the conglomerate which is seen at Ellington's is the southern outcrop of the basin, and that the northern one passes from Jones' falls up towards the Rocky river.

glomerates conform to the highest ridges, and follow them almost at a uniform height, leading to the conclusion that at some remote period the whole was deposited at the same time and derived from the same source.*

It is apparent, also, that the debris of the rocks in the upper or most western part of the valley have been carried by the water towards its eastern termination and deposited; thus the valley or lake (if such it was) has been gradually filled up and the river finally confined to the channel it now occupies, winding with little fall through the alluvial or drift, from ten to fifteen feet below the surface of the valley.

Although the deposit of coal in the Deep river district will not bear a comparison to the vast fields of that mineral in the western States, yet, owing to its position, proximity to market, and adaptability to many purposes in the arts, and connected as it is with extensive beds of iron ore, it may be esteemed of great value and interest to the State as well as of national importance.

The shaft which has been sunk by the Governor's Creek Coal and Iron Company, at Egypt, affords the most reliable evidence of the perpendicular section of the strata, to the depth of four hundred and sixty feet below the surface, and includes the lower coal seam.

This shaft has fully established the existence of several veins of coal as well as veins of valuable iron ores, lying in juxtaposition with the coal. It is situated fifteen hundred feet within the outcrop of coal, to the south, and perpendicular to its trend.

The annexed diagram exhibits a vertical section of this shaft, by which each strata may be seen with its approximate thickness or depth.

The strata in the shaft of Egypt, however, cannot be taken as a true development of the coal field. At short distances from it, both east and west, we find the sandstones in thicker masses, and replacing some of the slates exhibited in the section, which shows but a limited development of them. It will be seen that the first sandstone met with is at the depth of 323 feet, 100 feet above the coal, and but one foot in thickness. There are two lower seams, separated by a strata of black slate, with iron balls 405 feet deep, and one foot ten inches, and three feet in thickness.†

By this section we are assured of the depth at which the underlying seams of coal are found. Five are seen at the outcrop, which unite as they descend and form but four in the shaft. The large or six feet wide seam in the shaft, at Egypt, is 423 feet deep. Between the coal seams are found carbonates of iron, known by the name of the "blackband."

I think every one must be satisfied, from its regularity and the diminution of dip in the distance from the outcrop, (some eight or ten

* Many of these heights were kindly furnished me by Mr. Keuper, engineer of the Western railroad, to whom I have also to acknowledge my indebtedness for tracings of the railroad surveys.

† For the details of this section I am indebted to the report of Professor Emmons and that of Mr. McClane. These have been verified by specimens obtained of the different strata from the various depths.

degrees) that its seams tend to conform to the shape of a basin or trough.

It appears that the greatest depth of this coal basin is on the northern side, giving cause to believe that this valuable mineral does not extend below *such* depths as to render its mining both profitable and easy.

We may acquire some approximate estimation as to the quantity of coal this basin may contain by taking the data which our results give of the extent of the basin, viz: some 75 square miles, which there is every probability is underlaid by the veins of coal from which the value of this mineral wealth, locked up in this district, may be readily calculated.

Although we have no actual proof to offer, yet there can be but little doubt that the extent of the coal seams will be found to underlie the whole of the basin. I was very desirous to place the extent beyond question, and had it been in my power I should have ordered borings to be made, considering it of great importance in a national point of view; but as there was no appropriation made to meet the expense of this examination it could not be undertaken.

I feel it my duty, however, to recommend that a small appropriation be made for this purpose, which would establish beyond a doubt the actual extent of this coal field.

There is no anthracite coal in this field. In some places it is debituminous, viz: at Tysor's, Palmer's, and Wilcox's, where it has undergone, with the slates and beds of iron ore, much disturbance, probably by an upheaval, and afterwards been denuded by the action of the river, which has removed the debris of the rocks and exposed to view the shales and slates as far as the plantations of Mr. Alston and Mr. Glegg.

Through the heat of the trap dyke which has been injected near by, its volatile matter has been driven off, leaving it in a debituminized state, or nearly a natural coke. It corresponds in fracture with the coals of other localities in the field, and is known under the appellation of "dry coal;" but I have seen none with a concoidal fracture, which the true anthracites have as their distinguishing mark. The "Wilcox seam" is of this character; its outcrop corresponds in thickness with the upper coal seam.

In the neighborhood of the Wilcox place small seams of natural coke are found to crop out in juxtaposition with veins of iron ore. In some parts these have undergone great heat, sufficient to change them to scoria.

The coal lying to the northward of the Wilcox outcrop is, however, unaltered, and similar to the best kind of coal, affording evidence that the heat of the trap dyke has been confined to a limited space, and effected only a local change in the character and position of the coal along the line of its strike, which passes through the Evans, Tysor's, Palmer, and Haughton plantations, in a E.NE. direction.

There also appears to have been a disturbance near Evander McIver's, and an injection of trap, which, however, does not appear to have changed the coal, as at Wilcox's. Here we find the outcrops

of the black slates and ripple marked sandstones lying within a few hundred feet of each other, with opposite dips and strikes. The position of this outcrop is 150 feet above the plain of Egypt.

The sandstone, traced round to the southward of the black slate, is found of great thickness near the conglomerates in the neighborhood of McIver's mill, on the Great Buffalo creek.

This sandstone has larger ripple marks and is more argillaceous than that which underlies the coal in the shaft at Egypt, 450 feet below the surface, but otherwise resembles it.

It will be observed that these two strata, which we find in the shaft at Egypt underlying the coal, are here noticed to the southward and eastward of the northern outcrop, and apparently overlying it; but it is readily seen that they must be the sandstone and black slates of the southern side of the basin.

This disturbance probably took place before the injection of the "trap dyke."

The black slates pursue a direct course on their strike, and, after a considerable distance, disappear under the debris of the rocks. It is this locality where the two conglomerates approach nearest to each other.

I am strongly impressed with the belief that coal will be found within the area, between McIver's and Jones' Falls, or to the eastward, beyond where its outcrop is seen to end.

Nearly the whole of this space is now covered with forest, and a deep deposit of drift overlies it, so that no outcrop of the recent or older rocks appear.

The conglomerates consist of quartz pebbles of various sizes, most of which have undergone much attrition, some round, others oblong. These are intermixed with disintegrated slates of the older rocks, consolidated by a cement under great pressure.

In some localities the cement is mixed, more or less, with marly clays, colored red by the oxide of iron, which diminishes their hardness. With this exception, on the north and south sides, the conglomerates are alike.

At the west end the cement is the strongest, and the rocks are quarried for mill stones.

The red sandstone lying above the conglomerate is of a dark, purplish color, approaching that of a burnt brick. Its texture is even, composed of fine grains of quartz, is a good freestone, and has few marly layers.

The black slates lie next above the red sandstone, and is the rock in which the shaft at Egypt ends.

Above, in the series, they alternate with the argillaceous slates, and contain deposits of argillaceous iron ore. They are from fifteen to forty feet in thickness; this is the strata in which the fossils in the series are found, consisting of *posidonia*, *cythere*, &c.

The drab colored sandstone, known by its ripple marks, is a fine and compact kind. In color it is of a dirty buff or greenish yellow, and the surface is not unfrequently marked with marine plants. It is

suitable for grindstones, and might be used as a firm and solid material for building.

The bituminous shales in connexion with the coal are very inflammable, and burn with a white flame. They contain nearly 30 per cent. of volatile matter, and about 20 per cent. of fixed carbon; they will probably be used for the preparation of kerosene oil, though they do not yield the quantity that is obtained from the coal in the west. At the present price it can be manufactured from the shales at a profit. I have seen samples of it which had been well clarified. The bituminous shales all lie above the coal and in strata, alternating with the argillaceous slates. The fire clays do not occur, as in other coal fields, immediately below the coal seams; but the sandstone partakes somewhat of this character. They are interstratified with the slates. According to Professor Emmons, organic remains traverse them vertically; the plants are different from other coal fields, and the sigillaria have not yet been discovered.

The calcareous shales are greenish in color and resemble somewhat magnesian limestone. These contain no fossils, and in thickness vary from four to twenty-five feet.

The upper red sandstone differs from the lower in being soft and perishable, from its marly nature. In color it is of a light red, occasionally a light brown, mottled with green spots and often variegated. The outline of these is distinct. In it are found many cavities of irregular shape, around which is generally perceived, during the summer season, a white efflorescence; this proved to be common salt, (chloride of soda.) It was found more abundant on the western end of the coal field, where this red sandstone overlies the formations. In some cases wells which are sunk in this rock have brackish water; but where they go deeper than 30 to 35 feet the water is pure. In the deep shaft at Egypt the water is entirely free from saline taste. In my inquiries I was not able to learn of the existence of any salt springs. The upper red sandstone bears a resemblance to the lower in its lithological character, but there is a marked difference in their fossils.

The plant bed of Professor Emmons, I think, gives evidence that this upper red sandstone is totally distinct, and more recent than the coal formation of the valley of the Deep river.

It will be seen, from the foregoing remarks, that I am of opinion that this formation of coal belongs to the new red sandstone, and, as far as my observations have gone, the fossils appear to prove it.

The coal of the lower seam lies, as it will be seen, between two seams of black band ore, and more or less partakes of their character. It is consequently unfitted for use as a fuel, but is well adapted to the reduction, by roasting, of this ore for iron.

The three upper seams of the bituminous coal are well adapted for fuel, cooking, gas, and oil. It is a shining and clean coal, resembling the best specimens of Cumberland. It ignites easily, and burns with a bright, clear combustion, and leaves a very little purplish grey ash. It swells and agglutinates, making a hollow fire; is a desirable coal

for blacksmiths' use, for the parlor, and superior to most coals for the production of gas, for which it is likely to be in great demand. Its freedom from sulphur is another of its recommendations.

It is thought not to readily disintegrate by exposure to the atmosphere. Its coke is light and porous. When rapidly burned it inclines to melt and flow; but when under slow combustion it does not exhibit this tendency, which is owing to the presence of a large quantity of bitumen.

I was, at first, determined to have the iron ores of this district tested both by an assay and by chemical analysis. The former, it is believed, affords a more practical test of their value; but as it could not be obtained within the time, the chemical analysis was alone made. The ores and coal were submitted to Professor George C. Shaeffer, of this city, whose ability and care in this operation are well known, and who has afforded me full data of the results and the manner of conducting the analysis.

COAL FROM EGYPT SHAFT.

The mode of analysis was as follows: The coal was dried and coarsely powdered, and ignited in a covered crucible until all inflammable matter had been driven off.

The quantity of sulphur was determined by digesting the finely pulverized coal in fuming nitric acid, to which, from time to time, chlorate of potassa was added; by which process most of the carbon was oxidized. The sulphur was then estimated in the usual way—from the quantity of sulphate of baryta precipitated. The result was, sulphur, 1.3 per cent.

The large quantity of inflammable matter that the coal contains led to a slight variation in the results, as in one case the vessel was found lined with carbon deposited from the gas coming in contact with the highly heated surface.

The first specimen gives—

Bituminous matter as gas.....	30.
Fixed carbon, (coke).....	70.

Second specimen—

Bituminous matter as gas.....	34.
Fixed carbon, (coke).....	66.

The ash in first was 5.3 per cent.; second, 5.4 per cent. The composition of this coal is, therefore, as follows:

	Per cent.
Bituminous matter given off as gas.....	32.7
Fixed carbon, (coke).....	60.7
Ash	5.3
Sulphur	1.3
	<hr/>
	100.0
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Specific gravity.....	1.28	} 1.278 mean.
Another specimen.....	1.277	

The coal is a light, highly bituminous coal, yielding a shining and very porous coke and purplish ash, an excellent coal for making gas or for burning. It absorbs only $\frac{1}{2000}$ of its weight of water, after having been immersed for some time.

From Professor Johnson's able report we have several analyses of this coal, from the Farmersville estate, which give the mean results as follows :

Carbon	59.25
Volatile matter.....	30.53
Earthy	10.21
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	99.99
	<hr/> <hr/>

Specific gravity 1.409.

The dry or debituminized coal has less than one-quarter of the volatile matter that the bituminous coal contains. It is thought that it cannot compete with the true anthracites of Pennsylvania in the northern markets. It is, however, adapted for stoves, and for the reduction of iron ores in roasting.

I have heretofore stated that there is but a small quantity of this coal in the basin, and that it has been produced by a change in the bituminous, effected by the heat of the trap dykes.

Professor Schaeffer remarks on this description of coal from the Wilcox vein, that it has a cubical fracture, as is seen in some specimens of anthracite, with a metallic lustre. When it is heated to a high degree it decrepitates with violence, falling into thin plates.

The loss, after intense ignition in a covered crucible, was, in one experiment, 3.1 per cent., and in a second, 3.8. This loss is not imputed to the escape of bituminous matter, nor from enclosed, uncombined water; for both specimens were well dried. On an average the composition of this coal may be stated as follows:

Water and volatile matter.....	3.75
Fixed carbon	87.75
Ash	8.5
	<hr/>
	100.00
	<hr/> <hr/>

Specific gravity 1.8

The quantity of ash varies considerably, from 7 per cent. to 10 per cent.

When this coal has a cross fracture at right angles to its laminae, various substances, in solution, seem to have been introduced, particularly oxide of iron. This affects its quality.

The specific gravity and the increased quantity of ash confirm the supposition that this coal is, like the bituminous, deprived of its

volatile matter by heat, while under pressure, and that the decrepitation may be due to a constrained condition of its particles.

The large quantity of carbon it contains will render it serviceable in some metallurgic or manufacturing process, but as a fuel it cannot well be used, from the decrepitation it undergoes.

Professor Johnson gives the analysis of this coal, the mean of three experiments, viz :

Fixed carbon.....	83.13	83.36	87.18 =	84.56
Volatile matter.....	8.28	6.64	7.35 =	7.42
Earthy matter.....	8.60	9.60	5.47 =	7.89
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	100.00	100.00	100.00 =	99.87
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Mean specific gravity 1.49.

IRON ORES.

Professor Schaeffer was directed to examine the iron ores, with particular reference to a determination of their commercial value, or if they were combined with any injurious substances, especially phosphorus and sulphur. The method of analysis he reports as having adopted is as follows, viz: The ore was reduced, in an agate mortar, to an impalpable powder; a part weighed, then dried, and ignited in an open crucible to drive off water and burn all carbonaceous matter, and the quantity thus driven off and consumed determined.

It was digested in hydrochloric or nitro-hydrochloric acid, according to circumstances, until everything soluble was taken up; the solution was then, after dilution, filtered, and the residue insoluble in acid determined. This was mainly, if not entirely, silica. The acid solution, containing more or less of peroxide of iron, was then acted upon by a current of washed sulphurated hydrogen, or by its solution in water, until sulpho-cyanite of potassium gave little or no color, evidencing that all of the peroxide of iron had been reduced to a protoxide. The solution, smelling strongly of sulphurated hydrogen, was then boiled until every trace of this gas had disappeared.

The quantity of iron present was then determined by the quantity of a solution bichromate of potassa required to convert the protoxide to peroxide, as ascertained by testing with a solution of ferricyanide of potassium. The solution of bichromate was made according to the equivalents required. It was more than once tested by solutions of known quantities of pure iron, so that there might be no doubt as to the results. When any variations from this mode of analysis were adopted it will be noticed under the respective ores. All the ores were tested for the presence of sulphur and phosphorus. The test for sulphur was by the action of chloride of barium upon the acid solutions. The presence of phosphorus was determined by an acid solution of molybdate of ammonia in excess. This test gave a negative result, except in one case. The presence of either of these substances was only ascertained in the ores in which it is mentioned.

The *black band ore* is said to have been first noticed at the Farmers-

ville pits, where it crops out. It appears not to have been suspected as being similar to the black band of Scotland. At its outcrop it resembles the argillaceous carbonates, but the change it undergoes was thought to be owing to the influence of the weather. When found in the coal fields it invariably accompanies the coal seam. There is a seam lying between the two upper seams of coal of sixteen inches thick, and two others, each three feet in thickness, below the sandstone or fire clay, having a thin seam of coal between them. With this seam of coal they may be mined with great advantage.

This ore is readily distinguished from a slate by its brownish black color. It has an even fracture, slightly concoidal, massive and compact. After being roasted, it is strongly magnetic; it is easily converted into pig metal, and the coal mined with it is almost sufficient for this purpose. The iron produced from it is highly valued to mix with other ores for castings, but for forging it is deficient in strength and never used.

Professor Schaeffer remarks upon this black band ore, that it has a slaty structure, and is highly bituminous. The iron is present in the form of carbonate of the protoxide; there is also some carbonate of lime and the usual earthy matter in such ores. It loses when burned with access of air 39.9 per cent., 24 per cent. going off as gas; sulphur was present in considerable quantity, but not estimated. In its analysis the large quantity of bituminous matter had at first prevented the complete solution of the iron. This was discovered on igniting the silica after a prolonged digestion, when it was again digested in acid, and the whole of the iron obtained.

The composition of this ore is as follows, viz.

	Per cent.
Bitumen, carbonic acid, given off as gas	26.0
Fixed carbon	15.9
Earthy matter soluble in acid	28.4
Silica	12.5
Protoxide of iron	17.2
	<hr/>
	100.0
	<hr/>

Specific gravity, 2.12.

This small per cent. of iron led to the examination of another portion of this ore. It was first ignited, again pulverized and digested in acid. The result, however, was nearly the same as the above. The quantity of iron is too small to make this a good ore. It is more bituminous than the well known "black band," to which it bears a great resemblance.

The composition of this "black band" ore, according to the analyses of Dr. Jackson, is much richer, and gives—

Carbon	31.30
Peroxide of iron	47.50
Silex	9.00

Bitumen and water	8.81
Sulphur	3.39
	<hr/>
	100.00
	<hr/> <hr/>

The specimen analyzed by Professor Schaeffer contained, undoubtedly, much less iron than the general run of the vein, and much more bitumen, and, as he remarks, it might be used for making gas. He is of opinion it would bear the expense of transportation to be used for this purpose, (it furnishes, at least, one-fourth its weight of volatile matter,) as the sulphur is not given off until after the gas has escaped.

The presence of phosphorus was detected in this ore in considerable quantity, probably owing to the (coprolites) animal matter it contains.

Many coprolites are found in the black band, and fossils are also more abundant than in the slates. Professor Emmons found the Saurian teeth in great abundance in the seam, which intervenes between the upper coal beds.

Specular ores occur outside the sandstone formation, about six miles to the northward of the gulf, on the road towards the town of Graham. It is said to be in abundance, and the plank road passes not far from it. The analysis of the ore by Professor Schaeffer is as follows, viz:

Peroxide of iron	96.4
Silica	2.1
Earthy matter soluble	1.5
	<hr/>
	100.0
	<hr/> <hr/>

This is nearly pure peroxide.

The "heading ore" is also of this kind, and situated not far from it. It contains, viz:

Peroxide	98.2
Silica	1.4
Soluble in acid	0.4
	<hr/>
	100.0
	<hr/> <hr/>

Specific gravity, 5.09.

Prolonged ignition produced no appreciable loss in weight. Few ores are as pure as this, and none but the nearly pure magnetic oxide are richer in iron.

The hemetitic ores are some distance beyond, and 9 miles from the gulf, on a hill known as Ore Knob. It is elevated about 300 feet above the surrounding country, and covers about 350 acres. The ore is a red one. It is visible everywhere. A massive vein appears

to bisect the hill, and continue beyond to the southwest. Some specimens of fibrous ore were observed. The hill is well situated for mining, and has been opened in several places, and we were informed was worked in the revolutionary war. Some castings are said to have been found, which were made then, and proved, on examination, to be of great strength and toughness. The analysis by Professor Schaeffer is as follows, viz:

Peroxide of iron	74.3
Silica	10.6
Earthy matter	5.6
Water	9.5
Sulphur, a trace	0.0
	<hr/>
	100.0
	<hr/> <hr/>

The quantity of iron makes this a valuable ore.

Magnetic Iron Ore.—Its color is reddish brown; it lies in regular strata; is $2\frac{1}{2}$ feet in thickness. It is found in various places, but was observed especially at the Tysor place. Its analysis by Professor Emmons gives, viz:

Peroxide of iron	79.720
Carbon	7.368
Silica	4.000
Water	8.800
	<hr/>
	99.888
	<hr/> <hr/>

Contains 61 per cent.

When reduced to powder, this ore becomes of an olive brown color and attracted by the magnet. It is here that a company are erecting a Catalan forge, for the production of blooms.

The "ball ore" resembles the ore of the other coal formations. It has also been analyzed and found to contain, viz:

By Professor SCHAEFFER.		By Professor EMMONS.	
Protoxide of iron	40	Peroxide of iron	32.40
Silica	13	Silica	40.00
Carbonic acid and carbona- ceous matter	34	Carbonate of lime	4.72
Earthy matter	13	Carbonic acid	18.21
		Volatile matter	4.66
	<hr/>		<hr/>
	100		99.99
	<hr/> <hr/>		<hr/> <hr/>

There is another locality of iron ore lying without this coal formation, and rising through the older slate rocks, on the Cape Fear river, at Buckhorn Falls. Although it was not immediately connected with the district to which our examination was directed, yet it was visited. It lies some 9 miles below the junction of the Haw and Deep rivers, immediately on the east bank of the Cape Fear river. This ore hill

risers about 300 feet in height. It passes in a southeast direction for nearly a mile, and covers a surface of over 300 acres. It is somewhat dome-shaped, and appears to be one mass of very rich ore, having a solid vein of pure peroxide, which is 8 feet in width, while ores containing manganese and silicious matter extend beyond it on each side.

This remarkable ore was first discovered by Mr. Wm. McClane, but a few years since, and it probably has not its equal as a deposit of iron in this country short of the Iron mountain of Missouri. Professor Emmons says it is similar to that ore, as well as to that found on Lake Superior. It is a massive peroxide of iron, in composition similar to the well known specular ore; is of a dull reddish brown color, has a bright red streak, is not crystalized, but very heavy, tough but not difficult to break. He gives its analysis as follows:

By Professor EMMONS.		By Professor MORFIT.	
Peroxide of iron	95.20	Peroxide of iron	92.96
Silica	4.79	Silica	3.60
		Manganese	1.14
		Lime, magnesia, and alu- mina	2.32
	<hr/> 99.99 <hr/>		<hr/> 100.00 <hr/>

Specific gravity, 4.952.

Professor Emmons found neither alumina, manganese, or lime, nor was he able to detect sulphuret of iron, and does not believe the ore contains any foreign substance that would be injurious to its manufacture.

The specimens of which the above is the analysis were no doubt taken from the central part of the vein.

The specimen submitted to Professor Schaeffer was taken from beyond the vein, as it contains silix and manganese in some quantity. Professor Morfit's analysis of another portion exhibits nearly the same result:

By Professor SCHAEFFER.		By Professor MORFIT.	
Peroxide of iron	56.4	Peroxide of iron	42.00
Silica	26.4	Silica	27.20
Manganese and earthy matter	17.2	Metallic manganese	7.99
		Lime, magnesia and alumina	18.13
		Oxygen with iron	15.69
	<hr/> 100. <hr/>		<hr/> 99.82 <hr/>

Specific gravity 4.52 and 4.42.

It is quite evident that the above specimens were taken from different parts of the vein, and therefore the impurities appear. The first determination is to be taken as to the analysis of the pure ore, and the latter as that lying beyond the vein.

Professor Schaeffer found this ore excessively hard; sufficiently so to scratch glass, and difficult to pulverize. Some traces of a metal were precipitated from the acid solution by sulphurated hydrogen, which he believes was lead.

This ore can be transported for manufacture on the Deep river, or sent down the Cape Fear to Wilmington to be shipped to a northern market.

Thus it will be perceived that there is no want of iron ores of the finest kind for manufacturing the best quality of iron, and all that is required is limestone; but this is not to be found in the coal field of sufficient purity to be used. There are hydraulic limestones found in the shaft at Egypt, but they contain a great deal of magnesia. Analyzed by Professor Emmons, I find its contents as follows:

Silex.....	16.20
Carbonate of lime.....	42.600
Carbonate of magnesia.....	16.004
Iron	19.380
Alumina.....	0.750
Water.....	2.
	<hr/>
	96.934
	<hr/>

A limestone bed occurs at Evander McIver's, but it does not appear to contain much lime, and slacked very slowly; none of it is crystallized, and from the analysis of Professor Emmons, it contains a larger proportion of magnesia than the foregoing obtained from the shaft at Egypt, as follows:

Carbonate of lime	46.00
Carbonate of magnesia.....	28.70
Silex	10.40
Water	2.40
Protoxide of iron.....	5.60
Bitumen loss	0.00
	<hr/>

A strata of magnesian limestone crops out in the neighborhood of Evans' mills. Its strike is to the northward and westward.

Although there may be no limestone in this valley suited for the fluxes of the ores of iron, yet it can be readily obtained by the return boats from some of the deposits on the Cape Fear river, below Fayetteville, where shell lime exists in great quantities.

The composition of the calcareous shales, according to Professor Emmons, is as follows, viz:

Carbonate of lime.....	35.50
Magnesia	9.25
Alumina and protoxide of iron	15.70
Water	2.59
Insoluble	36.88
	<hr/>
	99.93
	<hr/>

Copper.—Several copper mines, lying on the northeast, near Rocky river, coming up through the metamorphic slates, have been discovered, and have proved very rich. I did not visit the localities, but saw a large number of barrels on their way to the north. It was the yellow and gray sulphuret, they informed me.

In speaking of the manufacture of iron, I must mention that *charcoal* can be had in any quantity and at a very low price, as the virgin forest yet exists in the neighborhood of the Deep River district; and those engaged in the use and manufacture of iron know that the best kinds of iron cannot be produced without this article, and that neither the anthracite nor bituminous coals, nor coke, can compare with it.

It is thought by those who have great experience in the manufacture of iron that there is no locality on the eastern side of the Alleghanies where a better article of iron can be produced than in the Deep River district, and at less cost. Its proximity to market gives it great advantages for becoming a large manufacturing district, which must be the case, from the weight and bulk of the coal and iron and its cost in transportation; besides, it will prove far more economical and profitable to manufacture articles on the spot.

I am of opinion that very little, if any, coal will be sent to market from this district, unless for use in generating gas, which may be able to afford the price it will command for the manufacture of iron.

There are few places to be found in our country where there is such a concentration of material, and which can be mined with so little toil and expense; an abundance of the best fuel, consisting of charcoal, and the mineral coals susceptible of being advantageously coked, and in great quantity and variety for all purposes of the arts, as well as domestic uses; fire clays for refractory furnaces; building materials of sandstone, gneiss, and granite; milestone grit, and fine sandstone for grindstones; clays and sands for the manufacture of glass and porcelain. Of the latter class there is a large tract near Jones' Falls—a part of the plantation of Captain Bryant.

Steatite, or soapstone, and agalmatolite are found in extensive masses in Chatham county, near Hancock's mills, in alternate beds with the metamorphic slates. The latter is of exceedingly fine and compact grain, and has a very soft and soapy feeling, and is of a greenish-white color. It is different in composition from the steatite or soapstone, and is of a much finer grain. It can be applied to the same uses; but that which has been quarried in Chatham county has been ground at Stuart's mills, on the Deep river, to a powder as fine as flour, and exported to New York, where it is used for clarifying sugar. It sells for \$18 or \$20 a ton; but in Carolina I was told that it was believed to be used for the adulteration of paints or soaps, and for a cosmetic. Its composition is given by Professor Emmons from an analysis of Jackson, as follows:

Silex	73.00
Alumina	18.76
Potash	2.00
Water	3.55
	<hr/>
	97.21
	<hr/>

Roofing slates are found on Rocky river, near the residence of Mr. Johnson. Specimens were brought me of some size and suitable thickness. They were of a light slate color, compact, and appeared to split smooth and even.

I had not time to visit the quarry, but learned from reliable authority that it was well situated, near the forks, and above water level, and could be easily obtained.

Timber.—The Deep River country is the dividing line between the alluvial and primitive formation. The change of vegetation has a well defined outline, the long leaved pine lying on the south, and the oaks and other timber on the north. Our examination of the timber extended not only over the Deep River country above described, but over many miles surrounding it. This examination proved conclusively that there was but a small quantity of large oak and other timber required for naval purposes. There are considerable quantities of the middle size, which is well adapted for the construction of vessels and machinery.

Most of the country has been cleared, and the large timber cut down or fallen; the few left standing are partially decayed and useless.

As the country is becoming more settled, and improvements are progressing, this timber will fast disappear. On the south the virgin pine forest yet exists, of which kind of timber there is an abundant supply of all sizes.

For the localities examined I annex hereto the report of Mr. Pook, naval constructor, whose attention was particularly directed to this subject.

In the examination of this district the water power claimed much of my attention. It has been previously mentioned that the Deep river has been dammed, to effect its slack-water navigation. These dams are five in number, with a fall of thirty feet, and the water is set back at the upper pool as far as Woomble branch. Beyond this is the Hancock mills, which is the only one I shall include in the Deep River district. The last dam is at Evans' bridge, where there is a lock, and several mills for grain, &c. The next dam below is at the Gulf, and has a large flour mill, as well as carding machines, owned by Mr. Lawrence Haughton. The third is at the bend of the river, below Egypt, where the fall is about seven feet. There is no mill yet erected at this place. The fourth is at Glegg's, below the Rocky river, and the fifth and lowest is at Jones' Falls. Here they are improving the water power, and several mills are being repaired and constructed. This fall is two and a half miles from the Cape Fear river. This slack-water navigation is uninterrupted, as will also be the mills, during the entire year.

Besides this water power on the Deep river, there are very many sites on the Haw, Rocky, and Cape Fear rivers, and on most of the creeks leading into the Deep river; there are mills for grinding the cereals and sawing the timber, of great convenience, as well as of advantage, to the country.

We now come to the consideration of the accessibility of this dis-

trict, or the ways and means of transporting its materials to the markets of the world.—(See map.)

The first which claimed my attention was the slack-water navigation of the Cape Fear and Deep rivers. This is effected through the construction of nineteen dams and locks, from Jones' Falls, on the Cape Fear, to above that at Evans' bridge, the pool of which latter reaches the Woomble branch of the Deep river. The whole distance is ninety-eight miles, and the height overcome 204 feet. The locks are 115 feet in length and 18 feet in width, and boats carrying from 100 to 120 tons, drawing six feet water, may navigate and reach the upper part of the coal field, passing close to the various coal and iron properties. The outcrop of the coal along this line is not elevated more than 100 feet; and, if mined from below, it can be taken out above the water level, so that the conveniences for the shipment of the production of this region will be very great when this work is finished. Had the dams and locks been properly and faithfully constructed, the economical geology of the Deep River district would have been long ere this developed, and the great and valuable interests in the production of coal and the manufacture of iron received a stimulus which would have added to the wealth of the State and of its inhabitants.

But this work has been procrastinated; the liberal appropriations of the State so lavishly squandered in the construction of inefficient dams and insecure locks, which were found inadequate to bear their *own* weight without the force of the water. It was, indeed, a great misfortune to this district, and, combined with the arguments relative to the existence of a coal basin by scientific gentlemen of high character and learning, tended to create prejudice and produce almost a total apathy on the part of the legislature towards making further appropriations or receiving subscriptions from individuals for finishing this great and useful work. Fortunately, by the well directed efforts of Mr. McClane, in sinking the shaft at Egypt, the truth of the existence of large quantities of coal was established beyond a doubt, and added much to the reputation of Professor Emmons, the State geologist, who had manfully persisted in maintaining what the result has proved.

It was a great satisfaction to perceive that this important work had fallen into better hands, and to learn from Major Morrell that the slack-water navigation would soon be in use.*

It is to be regretted, however, that the locks will be but temporary and require renewing. It is hoped that the legislature of the State will render some assistance in erecting permanent stone locks, to replace these wooden ones, and without loss of time.

As far as my own observation went, and from the report of others who are well acquainted with these structures, I should suppose that they might last some time. Some apprehensions are entertained relative to the two lower dams, which are built on the soft sandstone

* I hear, as this report is being handed in, that the first boats have passed, loaded with coal and iron ores, and some with cotton and flour.

rock, known by the name of "hard pan;" but I think without cause, if proper precautions are taken to prevent the undermining of the dams consequent upon the attrition of the rock by stones and gravel, which finally wear through it, exposing the sands beneath to the action of the water. Should this take place it would soon overtopple the dam. But, as the engineers are well aware of this defect in the rock on which they are built, I have no doubt they will take every precaution and keep the dams in good repair.

Below Fayetteville, some eight miles, the shoals of the Cape Fear river are encountered. When drought prevails there is not a sufficiency of water over these shoals to float a steamer drawing more than eighteen inches water. Mr. Pook reports that he was detained there some hours, and, in consequence, was thirty hours from Fayetteville to Wilmington on a small steamer.

These shoals it is thought could be avoided by a canal around them or deepened by a sluice. The river is navigable for ten months in the year, and boats used on the river and slack-water navigation can then pass free from all detention. It is desirable that this work should be accomplished, as great detriment must result to the trade when the western railroad and slack water navigation are completed, particularly during the season of greatest activity, as this river below Fayetteville is the common outlet for all the internal trade towards Wilmington and the Atlantic. Steamboats ply daily between Wilmington and Fayetteville, a distance of 100 miles, in twelve hours, and those of small size will be employed to tow the barges on the slack-water navigation.

Besides their slack-water navigation, the citizens of Fayetteville have undertaken to construct a railroad direct to the coal fields, with the intention of carrying it on to the junction with the Central road, near High Point, and have pushed its structure with great energy and perseverance. The whole route has been surveyed, and the road located the entire distance of fifty miles, a fourth part of which is now completed and in use. It is confidently believed that they will be able to finish the whole in a year. Having done thus much without any assistance, they hope to get some aid from the State, and of which their project is deserving. There need be no apprehension as to its detracting from the slack-water navigation, for there will be abundance of traffic for both. The one will assist the other, and both are essential for the conveyance of passengers and freight.

I see every reason to anticipate the influx of a large population, with an abundant capital, to mine and manufacture the raw material, in which case all the routes of transportation will receive as much encouragement as will satisfy the most sanguine expectations that may be entertained by the projectors.

The cheaper and more certain the conveyance of the productions and manufactured articles the greater will be the benefit to both projector and State.

Other improvements are projected; among them a railroad from the coal fields to Raleigh, a distance of some thirty miles. The route is a most favorable one, and will make another connexion with the Cen-

tral road, also with the Gaston and Raleigh, and through it with the Seaboard and Roanoke, which will place the coal fields into direct communication of a few hours with Norfolk.

Besides the above, there will be a connexion with the harbor of Beaufort, by the Central road to Goldsboro', and thence, by the Newberne and Morehead City, to that point. The distance of both the above routes is less than 200 miles. There is also a connexion talked of between Fayetteville and Warsaw, on the Wilmington and Weldon, and from the latter, by a branch road, at Kingston, which will give another route.

Deeming it a part of my duty, after I had completed the examination of the Deep River district, I passed over these routes, and to the seaboard at Beaufort harbor. That of Wilmington I was personally well acquainted with, and also with Beaufort, through the surveys. I need not, however, offer any remarks on either of these places, as they are too well known to require any description. Wilmington has a large and increasing trade, with an enterprising community. Beaufort is looking forward to becoming, at no distant period, a point of shipment for the productions of the State to the northern ports, and several distinguished individuals have embarked in the improvements with capital and energy.

Whilst speaking of the individual exertions made in the State, I should refer to the projects entertained in South Carolina of directing some of her lines of internal improvements towards those leading to the coal fields of the Deep river. Surveys have been made from Camden, by the route of Carthage, but I have some doubts of this being pushed forward with the energy that I found existing among the citizens of North Carolina, and the determination to carry on the works now constructing or about to be undertaken.

I cannot speak with any certainty of the improvements having begun in the Deep River district itself. A few years ago many companies were organized, and property purchased on speculation; but many projectors became disheartened, finding there would be no means of getting these raw materials to market, in consequence of the failure to establish the slack-water navigation; but as this event is at last consummated, they are about to be re-established and put in operation.

The property has passed out of the hands of speculators into those who intend to adapt its natural advantages to useful and profitable ends. With the opening of the routes I understand many will commence operations, and I make no doubt they will produce, in a few years, such changes in this district as will fully establish what is now only conjecture.

On leaving the Deep River district I took the plank road from the Gulf to Fayetteville, a distance of fifty miles, in a southerly direction. The country is very sparsely settled, and is generally covered by the virgin forest of long leaf pine. But few of the trees have been "boxed." The country rises until the plantation of A. Schermerhorn is reached, where it is four hundred feet above the level, and forms the dividing line of waters flowing north and south. Here the

Gulf plank road joins that from Fayetteville to Ashboro', in Randolph county.

From Schermerhorn's to Wilmington there is a regular series of undulations, not unlike the ground-swell of the ocean, extending to within a few miles of Fayetteville, and these undulations tend east and west, and appear to extend over this whole section of country; lie directly across the line of railroad, running nearly north and south; consequently require heavy, deep cutting. In one of these, about ten miles from Fayetteville, the substratum has been reached, corresponding to the surface undulations, and exposing to view the tenacious and unctuous blue clay of which it is composed.

I regret that my time did not permit my delaying to examine it carefully. The country, to within a few miles of Fayetteville, continues to be well wooded with the long leaf pine; the soil is sandy, though occasionally we passed over some of the sandstone, or the "hard pan rock," of the country, (and which frequently caps the undulations spoken of above.) It is of a dark brown or reddish color, is used in building, and is a cheap and easily wrought material, but cannot bear exposure to heat.

Fayetteville is well situated on the north side of Rockfish creek, some 72 feet above the level of the Cape Fear river, when at its lowest stages. During freshets the river rises 50 feet, but these pass off rapidly. On the Rockfish creek and the streams there is excellent water power, on which a number of mills have been established for the manufacture of cotton, paper, &c.

I was exceedingly gratified with my visit to the United States arsenal, in charge of Captain Bradford, of the army. Few establishments will compare with it for the arrangement of the buildings and proper adaptation to their uses. Every department of the army implements are here stored in a state for immediate use, and the good order, cleanliness, and system prevailing, show unceasing attention to the duties assigned him.

I understood that the whole had been under his direction from the commencement, except for a short time during the war, when he was employed in Mexico. A range of workshops have lately been added, and the machinery is being put up, to make it a manufacturing establishment as well as a depot. It is situated upon the high bluff overlooking the town, and commands one of the finest views in the country. To Captain Bradford I desire to return my thanks for his attentions to myself and other members of the commission; and to the citizens also, all of whom united to afford me every facility in their power.

I may make mention here, that I visited the "workshops" of the North Carolina Central Railroad Company, situated 16 miles east of Greensboro', where they have it in contemplation to manufacture all the machinery of the road. The shops are extensive, well arranged, and admirably adapted for the purposes intended; but I was disappointed in learning that all the iron used was imported from other States, and, therefore, I had no opportunity of seeing the iron of the State in use, or employed in the construction of machinery of any kind, as I had been led to anticipate; affording another proof that

the valuable productions of North Carolina are unknown, and consequently uncalled for.

Desirous of comparing the relative values of the iron ore of the Deep River district with those of the western part of the State, I made a visit to the "High Shoal falls," to inspect some of the forges which are now in operation at that place, and on the south fork of the Catawba, taking with me specimens of those of the Deep river, to compare them with similar kinds of ore, which I understood was now being produced in blooms or lumps from the Calatan forge in that part of the State. I was disappointed in finding the iron works at the "High Shoal" discontinued, and the water power exclusively applied to the reduction of gold ores. I saw, however, many specimens of the peroxide and argillaceous ores from which iron had been made, and which strongly resembled the specimens I had with me. I found several forges at work on the south fork of the Catawba, forging blooms, which they assured me were of the best kinds of ore that could be procured; but they were not comparable to the specimens I showed them, which they considered to be of the best kind. These forges were small and rudely constructed; the trip-hammer was worked by water power, which also gave the blast. They seldom produce over 350 pounds in a day, with two forges and three workmen, for which they obtain four and a half cents per pound, equal to about \$100 per ton. The fuel used was charcoal.

Having given the details of the examination of the Deep River country, its coal, iron, and timber, I shall consider that part of the resolution of the Senate relative to the "expediency of establishing, at some point in the State, machine and workshops for the construction of engines, boilers, &c., &c., for naval vessels." The contents of this report fully establish the fact that there is an abundance of the raw materials for the manufacture of iron of the very best description, for use in the construction of engines and boilers for naval vessels; that, with the exception of the largest size of timber, there is also an abundance of that material for use in the construction of the implements of wood employed on board naval vessels, and there is no doubt that all these materials can be obtained at less cost and of superior quality than elsewhere in the eastern section of the United States. This could be accomplished either by the government erecting furnaces for the reduction of the ores, or by encouragement offered for the best kinds of iron, &c., for these purposes.

There can be no doubt of the expediency of having the indestructible materials used in our steam navy, of the very best kind, constantly on hand, to meet the wants of the steam service; and I can see no difficulty in the government establishing machine and workshops for the construction of all the parts of the engines and plates for boilers, as well as workshops for the making of implements required, of wood, in the naval service.

As to the expediency of establishing these at some point in the State of North Carolina, you will be able to come to a correct conclusion upon the subject, now that all the facts are laid before you.

Our attention being specially directed to the Deep River country,

we have a better knowledge of it than any other part of the State; and we believe that no other portion of North Carolina can offer so many advantages for the manufacture of iron as the Deep River district. Besides an abundance of raw material, there is both water and steam power at command. The climate is salubrious and the country healthy; all kinds of provisions abundant and cheap. The agricultural products consist of wheat, corn, rye, and oats. Vegetables and fruits are to be had in their season, in plenty and of fine kinds.

The great advantages it offers to the miner and manufacturer of iron will insure a large population of those engaged in these pursuits. It is also desirable for the agriculturist; finer crops are seldom seen than those which fell under our observation, on the bottom lands, bordering the ravines and creeks, and they seldom fail.

The temperature neither partakes of the extremes of winter or summer; and those who have passed many years there enjoyed excellent health. Although constantly exposed during the months of August and September, in the hottest weather I felt little inconvenience and no debility from the effects of heat after I reached this district. The navigation of the river is never closed by ice, and travel on the railroads rarely interrupted.

The distance from Washington is less than 24 hours by rail, and when the contemplated improvements are finished there will be means of transportation north, south, east, and west.

I herewith submit copies of the reports of Chief Engineers Hunt and D. B. Martin, and Naval Constructor S. M. Pook, to me, relative to the fulfilment of the duties assigned them in the examination of the Deep River district. It affords me pleasure to state that their duties were performed to my entire satisfaction.

I annex a map of the Deep River district, prepared by myself, to which reference has been made in the body of this report.

I have the honor to be, with great respect,

CHARLES WILKES,

Captain United States Navy, Chief of Com'n.

HON. ISAAC TOUCEY,

Secretary of the Navy, Washington.

WASHINGTON, D. C., *December 4, 1858.*

SIR: Herewith enclosed you will please find our report on the examination of the iron, (ore,) coal, and timber of the Deep River country, in the State of North Carolina, as per orders of the Navy Department of the 21st of July last.

First, we would please state that this report has been delayed, waiting for samples of minerals to be sent from the Deep River country to be analyzed, as we wished to give the analysis in this report; but as they have very lately arrived, and it requiring considerable time to make the analysis, which is being done under your

directions, and as you informed us you would state the analysis in your report, we concluded it unnecessary to wait longer for that purpose.

As our orders referred particularly to the examination of iron, coal, and timber, we think it proper here to state, that in consequence of there not having been any furnaces in operation, or, as yet, no iron made in that section of country, we cannot report what will be the *quality* of iron made, should furnaces ever be put in operation, as that will depend almost as much on the manufacturing as on the raw material; even a chemical analysis showing the component parts of an ore will not determine the quality of the products of a furnace. But from the great quantities of ore we saw in different localities, together with the various kinds and qualities—some exceedingly rich—we have no hesitation in saying there is in the Deep River country almost inexhaustible quantities of ore, from which, by a proper selection and mixing, the very best quality of pig or wrought iron can be made.

Of coals, as you are aware, there are two kinds. We shall speak first of the bituminous, which appears to be the general product of that coal field. A sample, sent on, was tried in the smith shop in the Washington navy yard, and compares well with the Cumberland coals used there. It appears quite free from sulphur or slate, and leaves very little earthy matter.

Though we do not believe that the average produce of the mine will compare in quality with the small sample sent for test, (as that is contrary to our former experience,) yet we *have no doubt* that, by careful mining, the coals of the Deep River valley will compare well in quality with any bituminous coals in market, and will ever find ready sale either for smith's use or for making gas, and with properly constructed ovens it will make a good coke for the manufacturing of iron. For steamers it is not as good as Pennsylvania anthracite. The seam of semi-bituminous coals discovered in the Deep River valley containing, as it does, so little volatile matter, it nearly approaches anthracite. In our opinion it can never have much local value so long as good coals are so abundant; and we think it is of too poor quality to pay transportation and compete with the poorest quality of anthracite now in market.

The extent of the Deep River coal field, or the probable supply contained therein, is a question more properly belonging to geologists, and we presume will be given in your report, as far as could be ascertained, though we trust it will not be improper for us here to state that the slopes, shafts, and pits which we were shown, prove a continuous seam of coal on the northern outcrop, from McIvers' plantation, proceeding up the river eighteen or twenty miles; and Professor Emmons, in one of his reports, says: "Its outcrop of coal, or line upon which it has been proved to exist, is about thirty miles." That being the case, and there being two or three seams of coal, one of which is six feet thick, we think there can be no doubt there will be an abundant supply for a long period, either for commercial or manufacturing purposes.

The Deep River country abounds in a variety of timber, though as far as we saw we should judge there is but little which will answer for ship building, even if there were means for transporting it to the seaboard. The long leafed or yellow pine is most abundant, and forms almost interminable forests on the south side; while on the north and west there is a variety of oak, intermixed with hickory, ash, elms, and short leafed pines.

Should it ever become a manufacturing country, there will be found a plentiful supply of good timber for all local purposes. But in a country where good iron ore is so plentiful the otherwise useless forests of timber might be profitably used in the manufacturing of iron, as charcoal pigs, or blooms, find a much more ready sale and bear a higher price than iron made with mineral coals.

Although our orders do not call for information on the following subject, yet we deem it our duty to state the fact, that whatever may be the natural resources or mineral wealth of the Deep River country, they are as yet, in a commercial or manufacturing point of view, of but very little value, as there is no way or means of transporting them to market, either by water or railroad. What may be done hereafter we know not; that is the present condition.

We are, respectfully, your obedient servants,

H. HUNT,

Chief Engineer United States Navy.

DAN. B. MARTIN,

Chief Engineer United States Navy.

Captain CHARLES WILKES,

United States Navy.

WESTERVELT SHIP YARD,

New York, September 6, 1858.

SIR: In obedience to your order I have examined the timber lands in Deep River country, and respectfully report that I first took a course through the woods from Haywood to Egypt, between Deep river and Lick creek. I found the pines decayed for about one-third the distance, and the balance well timbered with the long leaf pines, but they are generally too small to be useful for naval purposes, being under 16 inches in diameter, although there are a few from 20 to 24 inches.

I then returned to Haywood from Mr. McIvers', to Captain Bryant's, turning down the road from Fayetteville towards Lick creek, and then to the Cape Fear river, keeping along the creek and crossing the road into the low grounds of the creek and Cape Fear river until we came on the land of Dr. McCoy, and then back to Bryant's. From Bryant's we again took a course towards Egypt, keeping along the Deep river, and about half a mile distant from it, turning down into the low grounds at various points, examining for the white oaks. There are many oaks of the smaller growth, from 16 inches and less

diameter at 25 to 30 feet above the ground, but very few of suitable size for naval purposes. The largest I saw was on Dr. McCoy's plantation, where there is a small tract of uncleared land (about two miles by a half mile) of the white oaks and overcup oaks, but very few that would work more than 12 or 14 inches square 40 feet above the ground. Similar timber grows from Lick creek to below Buckhorn falls, but there are no large tracts of white oaks suitable for naval purposes, although there are a few, scattered here and there, which would answer.

I then visited the Crabtree and White Oak creeks, where there are white oaks of a larger growth, and some of them suitable for naval purposes, for planks, stocks, &c.; but no large tracts of uncleared land between Haywood and the New Hope, and but a small number of trees of the larger growth in this vicinity. On the New Hope, from Farrington's to Chapel Hill, there are some of the largest trees I have seen, but they are principally of the overcup and chestnut oaks, which are not considered so good for naval purposes as the white oaks which grow upon higher ground. But few of the white oaks of sufficient size are found upon the high grounds, although there are many trees on this section suitable for plank, stocks, &c.

I would here remark that the roads are very bad, the country undulating, and it would be very difficult to transport timber of the large size any distance.

From New Hope creek I proceeded back to Egypt, and from thence took the road to McLendon's creek and to Tyson's creek, and in this vicinity the timber is similar to that found at New Hope, but the lands are generally cleared where the large timber has grown, except on this creek.

We proceeded southwest from Tyson's to Richland creek, passing some pine woods, of small size, on Harrington's land; from thence to Carthage we saw some pine woods, which have not been cut into, where the land is uncleared and covered with long leaf pines suitable for plank stocks for naval purposes; but, so far as I examined, large trees are fewer in comparison with those of smaller size. From Carthage we took a northeast direction through the woods to the head of Cowley and Governor's creeks to the branch plank road leading to Carbonton and the Gulf, striking the plank road near McIntosh's and Riddle's, towards Eli Craven's; I saw no timber of suitable size for naval purposes on this route until we came to the pine wood between the plank road and the Little Pocket; from this point towards Buffalo Church are some of the large pines on the uncleared lands, but no large quantities of the trees of the larger growth, the majority of them being small in diameter. In passing through the woods from the Buffalo Church on to the plank road leading to Fayetteville, I saw very few trees of the larger size, although there are an abundance of small trees from twelve to sixteen inches in diameter. There are no roads or means of transportation for large timber, and the country is much broken.

I visited the arsenal at Fayetteville, and saw suitable workshops

with steam engine and timber sheds, where may be manufactured all articles required for army or naval purposes.

I also visited Rock Fish mills, where there is a paper mill and cotton factory, with abundance of never-failing water power, available for any purpose.

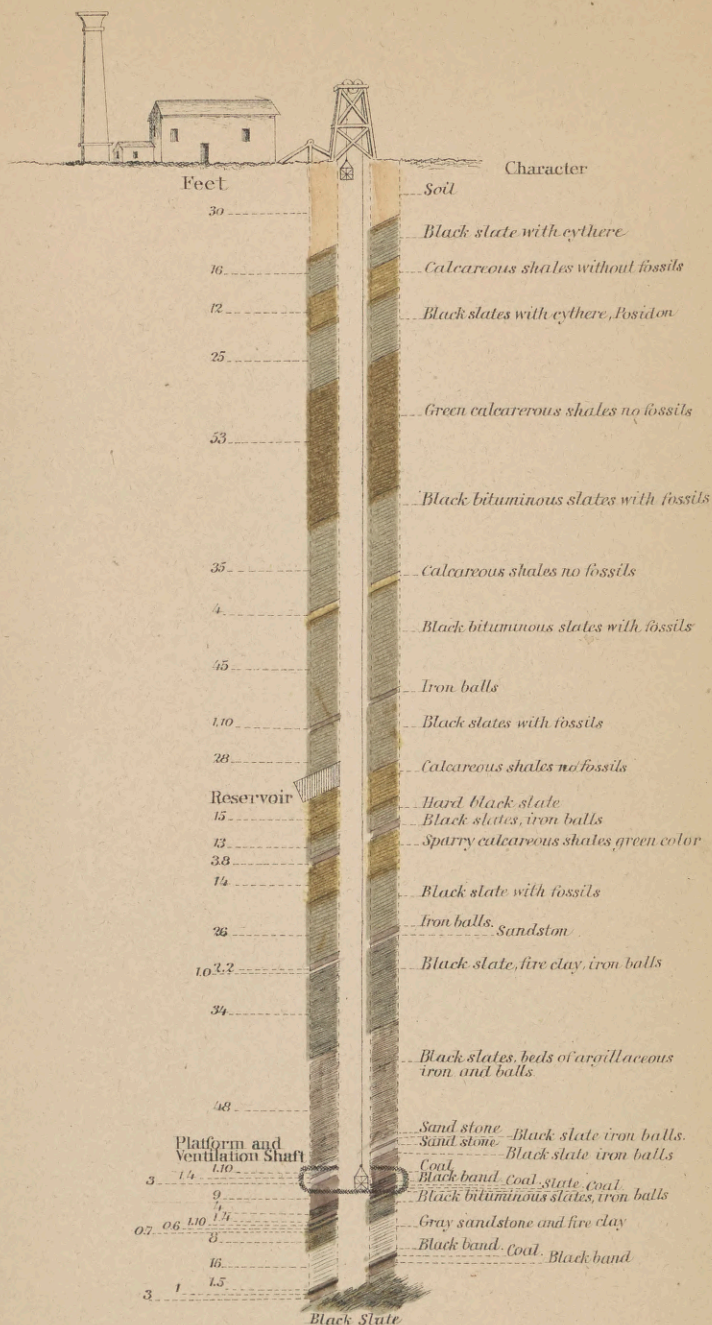
The railroad, in course of construction from Fayetteville to the coal fields, is finished about eight miles from there. It is supposed it will be entirely finished by next spring. It is also in contemplation to connect this road with the North Carolina road at Warsaw, which intersects the Wilmington and Weldon road about forty-eight miles from Wilmington.

The distance from Fayetteville to Wilmington by the Cape Fear river is said to be 120 miles. I was thirty hours going the distance in the steamer. We grounded about eight miles from Fayetteville, although drawing only eighteen inches. I am told that from four to five feet water may be depended upon for ten months in the year.

Respectfully yours,

S. M. POOK.

Captain CHARLES WILKES,
United States Navy.



Section of the Egypt Shaft 460 feet deep



